Sunseeker Energy Concentrator Solar Transducer System Mark 3

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Sunseeker Energy Limited
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This document has been prepared to provide some insight into Sunseeker Energy's premium product, the mark three photovoltaic transducer system. It contains easy to understand explanations of some our key features and advantages. If you would like more detailed information, please contact one of our representatives.

Introduction:

The Sunseeker solar transducer system is a concentrator type photovoltaic system capable of operating reliably at a concentration of up to 700X sunlight. It can be supplied as either a complete domestic low profile module, a larger light industrial module or as a wafer and transducer only for either retrofit into older style gantry concentrator systems, or new installation specifically designed around this technology.

The Sunseeker energy solar cell has developed greatly since its inception almost five years ago. Since the first working unit was achieved in 2005, many revisions have been designed, manufactured and tested to bring the most efficient solar technology to the marketplace. By thorough engineering testing and innovation, AERGA, Sunseeker's Australian research arm has managed to refine the concept of concentrator photovoltaics further again, into a unique package that not only out-performs the competition, but has excellent characteristics for real world systems. These new concentrators are small, powerful, and inexpensive and can be deployed in forms that have as little as one cell, or enough to power an industrial solar power plant.

Features:

Sunseeker has applied for Australian and international Patents on the new Mark 3 unit and we are pleased to announce a few of its new and innovative features.

- On board microcontroller for power handling
- Mossfet based switching control
- Reverse switching topology to provide a case earth avoiding the need for case positive components
- On board power measurement
- A serial bus to communicate with tracking sensors and adjacent cells for ultimate sun alignment and efficiency
- Large copper heat sink flange for flexible cooling options
- 7.38A saturation current wafers for high drain power production
- Wider safe operating temperatures
- Compatibility optimized to ensure all wafers in system contribute to power production, rather than failed wafers contribute to power losses

The current technology developed by Sunseeker has also enabled the systems to further modularize, whilst remaining flexible enough that the core technologies can be packaged in many forms based on the requirements of the end supplier's market.

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The basic parameter of the Sunseeker unit is that it is an electronically controlled small multijunction concentrator type transducer set. Within the set there are two types of cell assembly, the controller assemblies and the controlled assemblies.

The controller assemblies and the controlled assemblies produce exactly the same specified levels of power, and utilize the same power handling characteristics that allow the Sunseeker units to take a low voltage power source with high current from the wafer and transform it into a much higher voltage at the output terminals that connect the cells together in the assemblies. This alone allows for much more efficient transmission of electricity in a big array, but the Sunseeker system goes further, using a particular type of circuit that eliminates the need for "flyback Diodes" or a device to block a backward flow of current within an array. The flyback diode is currently industry standard, which is an inefficient, albeit necessary component in current solar arrays.

Sunseeker's on board control systems use an "intelligent approach" whereby a microcontroller monitors the cell output, optimizes the power split in Volts Vs Amps to achieve the most efficient extraction of power from the cell, and then converts this to a specified output voltage, usually 12 or 24V per wafer assembly.

This system has many advantages, a few of which are outlined below:

- It is configurable into multiple splits of parallel and serial units to give a desired max power at a given constant voltage this ensures the grid side inverter is always running at its most efficient input voltage, reducing conversion losses in a grid tie system.

- On a small scale battery only installation it eliminates the need for a separate power management module altogether, as the cells will always float above the battery charge voltage, and never allow power to be drawn from the battery, with the exception of any power that the system actually needs for early morning tracking.

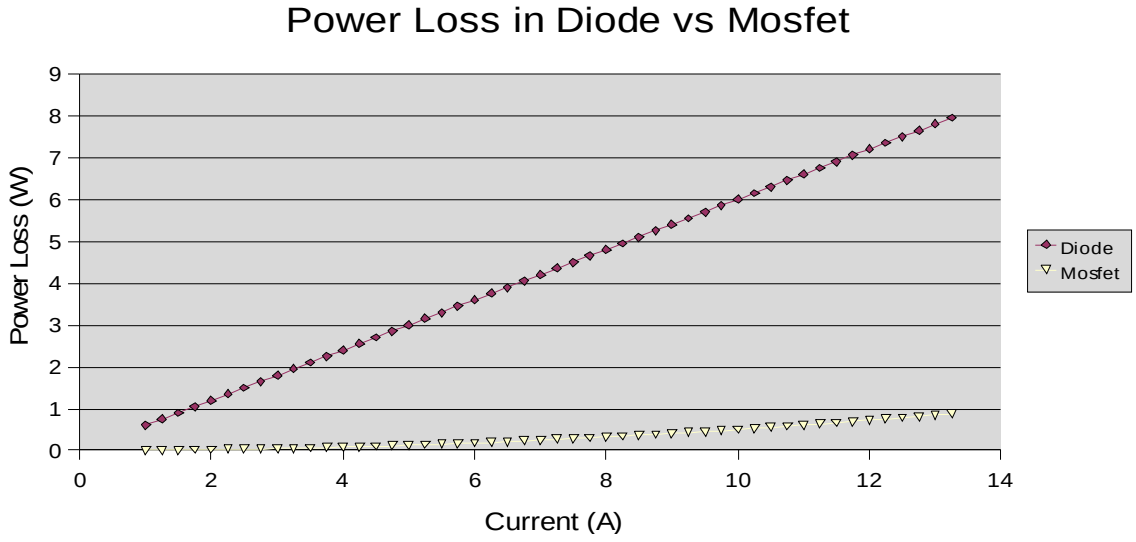
- It reverses the polarity of the anode and cathode on the wafer, and uses an advanced method of power handling called reverse switching topology circuitry (Pat. applied for) to ensure that the heatsink and ground plane are not positively charged. Not only does this have positive electrical safely repercussions, it allows the Sunseeker unit to be more efficiently water cooled (when water cooling is required or specified) because there is no requirement for the installation to be a closed insulated cooling system. The Sunseeker system can even be cooled using salt water from the ocean (material specification specific) as no power can leak through the electrically conductive salt water to ground. A wafer simply bonded to a metallic heat sink cannot be hooked up in such a manner, as the positive charge produced on the heatsink would simply short circuit.

- All this is achieved using widely commercially available components, with the only Sunseeker specific components being the circuit board itself, the heat sink and the bonding and assembly process (Pat. applied for).

These are simply a few of the advantages of our concentrator transducers when compared with our competitor's systems.

Efficiency:

The following graph demonstrates the low loss when compared to traditional power handling components found on both concentrator and non concentrator systems



When you take in to account that a concentrator type cell usually has a saturation (max) current of around 8 amps it is obvious that to run a diode on each cell would protect that cell but consume around 25% of the total power from a 20W, 2.5V wafer.
Sunseeker systems achieve the same level of protection for the wafer using 0.27W at saturation current of the Spectrolab ™ multijunction concentrator cells.

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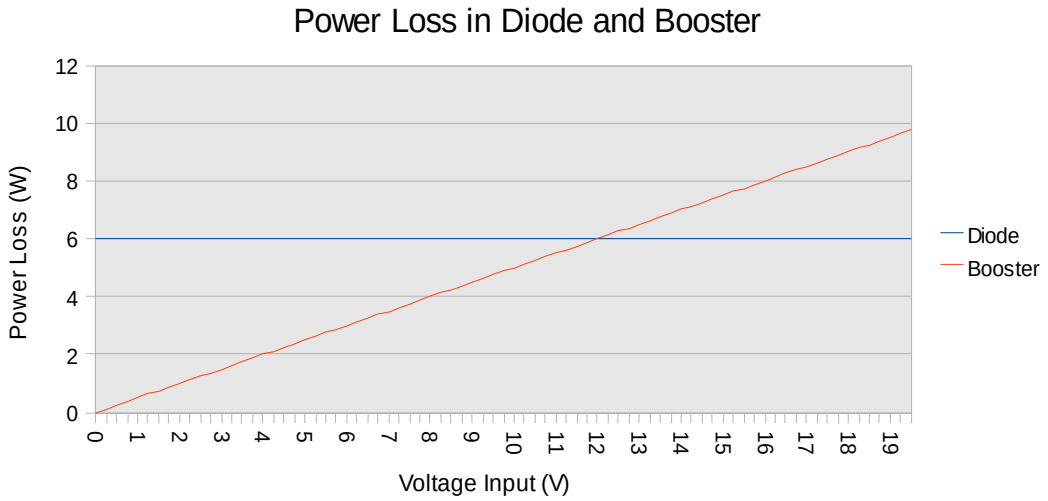
The following shows the relationship between a Sunseeker System and a traditionally protected diode system



For a traditional diode system to outstrip the efficiency of the Sunseeker system, 10 wafers must be strung in series, and operating at maximum efficiency. In reality, due to the changing levels of sunlight over the course of a day, the number is higher than 10, and is usually around the 15-20 mark. The on board circuitry of the Sunseeker wafer iterates the load to the cell handling circuitry to keep the current at a maximum, thereby minimizing the voltage that can be produced by the cell. As the graph demonstrates, the lower the voltage, the more efficient the Sunseeker system, so not only do we have a loss saving in the order of 55%, the failure risk for a single unit results in $1/20^{th}$ of the power loss. When this is combined with the individual nature of the Sunseeker transducers makes the replacement cost of any failed or underperforming cells significantly cheaper than many of our competitor's designs.

Flexibility:

The new Sunseeker transducer system is infinitely flexible, as each transducer is a standalone power production unit. The on board microcontroller has an infinitesimally small power requirement, and as such needs no external power to start the system working. The Sunseeker control systems make an old Casio solar calculator look power hungry!

With this in mind, they can be configured to sit up the side of poles, vertically oriented anywhere where the sun never passes directly overhead (and the amount of land on the equator where an on pole type application would be required is very small)

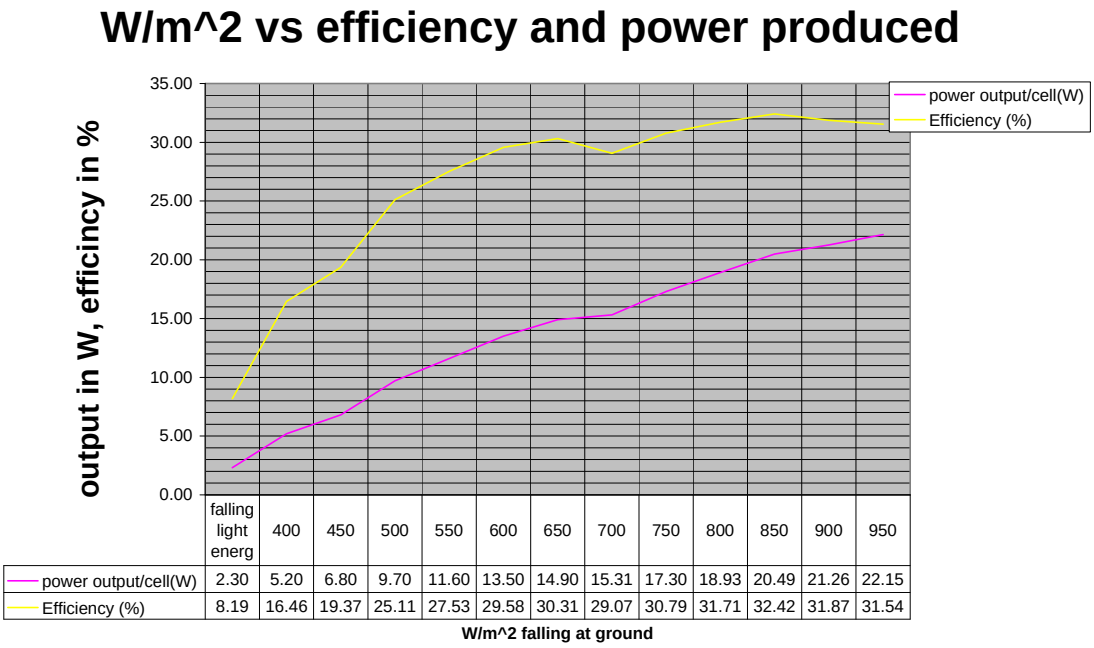
They can also be mounted atop a dedicated pole structure to keep them high off the ground and out of both peoples and harm's way.

It goes without saying that rooftop mounts are possible, and this embodiment of the system gets special note in our patent application.

Power stations benefit greatly from the high power output coupled with the small space required to produce that power. Even when cheap amorphous type systems are compared in dollars/watt, they cannot come close in $/W/m^2. This is simply because the high efficiency of Sunseeker cells allows them to make up to three times the power of some popular amorphous cells in the same given physical area. Capital cost is reduced with the reduced area, or conversely the capital cost of the electrical installation is better recovered with the higher power outputs.

Performance

The following shows the behavior of the Sunseeker system at various ambient light levels, and helps us to describe the competiveness of the system even when the light levels are low. Sunseeker systems quickly outperform the known low level light performance cell, which is amorphous silicon, and even at low output and efficiency levels, their direct light performance is comparable.



	falling light energ	400	450	500	550	600	650	700	750	800	850	900	950
power output/cell(W)	2.30	5.20	6.80	9.70	11.60	13.50	14.90	15.31	17.30	18.93	20.49	21.26	22.15
Efficiency (%)	8.19	16.46	19.37	25.11	27.53	29.58	30.31	29.07	30.79	31.71	32.42	31.87	31.54

Thank you for your interest in the Sunseeker Energy Limited.

Antony Howard
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Sunseeker Energy LTD.